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(19)

(54) IMPROVEMENTS IN TUBE COUPLINGS

(71) We, THE WEATHERHEAD COMPANY, a corporation organised and existing under the laws of the State of Ohio, United States of America, of 300 East 131 Street, Cleveland, Ohio 44108, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to tube couplings of the kind which comprise a first tubular screw threaded coupling member, a second tubular screw threaded coupling member arranged to be screwed to the first member, and sealing means which when tightened by tightening of the screw threaded connection between the second coupling member and the first coupling member forms the sole means which prevents fluid leakage between a tube and at least one of the coupling members.

In couplings of this kind, one coupling member is usually in the form of a body and the other in the form of a nut which screws onto the body. The sealing means is in the form of a ring having a sealing portion which is deformed on tightening the nut on the body to seal against fluid leakage. Such tube couplings provide an adequate seal when the sealing portion is deformed more than a first predetermined amount and less than a second predetermined amount, or, stated another way, when the body and the nut are between first and second predetermined positions relative to one another. This is particularly critical with respect to tube couplings which are used with plastic tubing.

It is presently known to use a torque indicating spanner or wrench to determine when the body and the nut have been tightened together between such first and second positions to prevent fluid leakage. It is also presently known to use a stop positively to prevent the body and the nut from being tightened beyond the second predetermined position to preclude over-tightening.

According to this invention a coupling of the kind described is provided with a visual indicating ring which is spaced from the sealing means and includes oppositely facing end surfaces with an outwardly exposed axially extending outer surface between them, the indicating ring being made of resiliently deformable material and having, when unstressed, an axial extent at least twice its radial thickness, the indicating ring surrounding one coupling member and having its end surfaces engaged by faces on the coupling members but being undeformed when the first coupling member is tightened to a predetermined position relative to the second coupling member at which the sealing means is sufficiently tightened to produce a seal, and the indicating ring being visibly deformable to permit further tightening of the first coupling member relative to the second coupling member beyond the predetermined position.

In a specific embodiment, the tube coupling is intended for use with plastics tubing and the indicating ring is disposed on the outside of a body of the coupling beween axially opposed abutment surfaces of the body and a nut which forms the other coupling member. The abutment surfaces engage the end faces of the ring directly to indicate that the nut is tightened to the first predetermined position relative to the body. The axially opposed abutment surfaces of the body and the nut axially compress and radially outwardly deform the ring when the nut is further tightened onto the body.

In this manner, the invention provides a tube coupling in which a positive indication is given when the relative position of the nut with respect to the body member, at which the tube coupling will prevent fluid leakage,

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is reached. Because the indicating ring is deformable, it readily permits further tightening when required, and furthermore it may provide a noticeably increased resistance to further tightening to give a further indication when the first predetermined position is reached. When the indicating ring is disposed on the body, the axial length of the ring may be changed when the tube coupling is to be used under different pressure conditions. Furthermore, because the ring extends around the entire circumference of the body, it may be seen even when the tube coupling is used in a partially enclosed or obstructed location.

An example of a tube coupling constructed in accordance with the invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a partly sectional side view of the tube coupling and a plastics tube with the coupling members loosely coupled together;

Figure 2 is a fragmentary sectional side view of the tube coupling with the coupling members tightened together to first predetermined relative positions; and

Figure 3 is a fragmentary sectional side view of the tube coupling with the coupling members tightened to second predetermined relative positions.

Referring now to the drawings in greater detail, Figure 1 shows a tube coupling which includes a body 10 having a bore 11, a first counterbore 12, a second counterbore 13, and a conical camming surface 14 together extending from end to end through the body 10. A shoulder 15 is formed at the junction of the counterbores 12 and 13.

The central portion of the body member 10 includes a hexagonal spanner receiving portion 17. An externally screw-threaded left-hand end portion 18 extends to the left from the hexagonal portion 17 to permit the body 10 to be screwed into a fluid storing container or a fluid supplying member or other desired part. An externally screw-threaded right-hand end portion 19 extends to the right from the portion 17 to a radial end face 20, and is received in a nut 22.

The nut 22 includes a hexagonal spanner receiving portion 23 and an internally screw-threaded portion 24, into which the externally threaded portion 19 of the body 10 is screwed. The internally screw-threaded portion 24 extends axially from the left-hand end of the nut 22 up to a shoulder 25 and a conical camming surface 26. A cylindrical bore 27 extends from the camming surface 26 to the right-hand end of the nut 22.

A cylindrical nylon tube 32 extends through the bore 27 and through the internally screw-threaded portion 24 of the nut 22, and is received in the second counterbore 13 of the body 10. The tube 32 has an external peripheral surface 33, and an internal peripheral surface 34, and an end face 35.

A sealing ring or ferrule 39 is loosely disposed on the external peripheral surface 33 of the tube 32 before the body 10 and the nut 22 are tightened together, as seen in Figure 1. The ferrule 39 includes an internal peripheral surface 40, a first conical camming surface 41, a second conical camming surface 42, and radially extending stop portions 43 and 44.

A bumped stiffening tube 50 includes a larger diameter portion 51 received within the first counterbore 12, a bumped portion 52 received by the second counterbore 13 between the shoulder 15 and the end face 35, and a smaller diameter tail portion 53 received within the tube 32.

An indicating ring 57 is carried by the screw-threaded end portion 19 of the body 10. The ring 57 extends about the entire external periphery of the body and which has oppositely facing end surfaces 58 and 59. The ring 57 also has an outwardly exposed axially extending outer peripheral surface 60 and an inner peripheral surface 61. The inner peripheral surface 61 is dimensioned so that it snugly engages the threaded end portion 19, so that it may be manually pushed over the end portion 19 but will not accidentally fall off the end portion 19 when the body 10 and the nut 22 are separated.

When the loosely coupled body 10 and nut 22 as shown in Figure 1 are tightened together, an abutment surface 65 of the nut 22 engages the end surface 59 of the ring 57 and pushes the end surface 58 against an abutment surface 66 on the body as shown in Figure 2. The length of the ring 57 is selected so that this occurs when the camming surfaces 14 and 26, acting on the camming surfaces 41 and 42 respectively, have deformed the ferrule 39 radially inwardly, and the end face 35 has compressed the bumped portion 52 of the tube 50 against the shoulder 15 so that the tube coupling will prevent fluid leakage. In this manner, the ring 57 indicates that the nut 22 has been threadably tightened on to the body 10 so that the nut 22 is in a first predetermined position relative to the body 10 at which the tube coupling will prevent fluid leakage. Because the ring 57 extends entirely around the circumference of the body, the indication may be seen even when the tube coupling is used in a partially enclosed or obstructed location. This obviates the necessity of using a torque spanner to determine when this occurs, thus ensuring adequate tightening while eliminating tightening beyond the required amount to enable the tube coupling to be re-used. When the nut 22 is in this first predetermined position relative to the body 10 as

shown in Figure 2, the ring 57 is not deformed and the abutment surfaces 65 and 66 just touch the end surfaces 58 and 59, respectively.

When the tube coupling has been uncoupled and is to be recoupled, or if the tube coupling begins to leak, it is necessary to tighten the nut 22 on to the body member 10 beyond the first predetermined position shown in Figure 2. Becuase the ring 57 is deformable, it does not have to be removed. As seen in Figure 3, the nut 22 may be tightened on to the body 10 beyond the first predetermined position to a second predetermined position relative to the body 10. When the second predetermined position of the nut 22 with respect to the body 10 has been reached, the stop portions 43 and 44, of the ferrule 39 engage surfaces 20 and 25, respectively, to prevent overtightening of the tube coupling and consequent leakage or breakage.

In the preferred embodiment the ring 57 is of a resilient polyethylene material, and as is essential the axial length of the ring 57 is at least twice its radial thickness. This provides an indicating ring which is readily deformable when the nut 22 is tightened from the first predetermined position, but which does not noticeably increase the torque required to so tighten the nut 22. In an alternative embodiment, the ring 57 is of polytetrafluoroethylene. This provides an indicating ring which noticeably increases the torque required to tighten the nut 22 beyond the first predetermined position while permitting the ring 57 to be deformed when such further tightening is required. This alternative embodiment is particularly suited when the tube coupling is used in an enclosed or obstructed location which may not easily be viewed, because it provides a torque indication as well as a visual indication when the first predetermined position has been reached.

WHAT WE CLAIM IS:—

1. A tube coupling comprising a first tubular screw threaded coupling member, a second tubular screw threaded coupling member arranged to be screwed to the first member, sealing means which when tightened by tightening of the screw threaded connection between the second coupling member and the first coupling member forms the sole means which prevents fluid leakage between a tube and at least one of the coupling members, and a visual indicating ring which is spaced from the sealing means and includes oppositely facing end surfaces with an outwardly exposed axially extending outer surface between them, the indicating ring being made of resiliently deformable material and having, when unstressed, an axial extent at least twice its radial thickness, the indicating ring surrounding one coupling member and having its end surfaces engaged by faces on the coupling members but being undeformed when the first coupling member is tightened to a predetermined position relative to the second coupling member at which the sealing means is sufficiently tightened to produce a seal, and the indicating ring being visibly deformable to permit further tightening of the first coupling member relative to the second coupling member beyond the predetermined position.

2. A tube coupling in accordance with Claim 1, wherein the outer surface of the indicating ring is exposed to view around the entire circumference of the tube coupling.

3. A tube coupling in accordance with Claim 1 or Claim 2, including stop means for preventing the first coupling member from being tightened beyond a second predetermined position relative to the second coupling member.

4. A tube coupling in accordance with any one of Claims 1 to 3 wherein the ring is of resilient plastics material.

5. A tube coupling in accordance with any one of the preceding claims for use with plastics tubing, wherein the sealing means includes a deformable sealing ferrule for surrounding the plastics tubing and a stiffening tube for insertion into the plastics tubing.

6. A tube coupling according to Claim 1, substantially as described with reference to the accompanying drawings.

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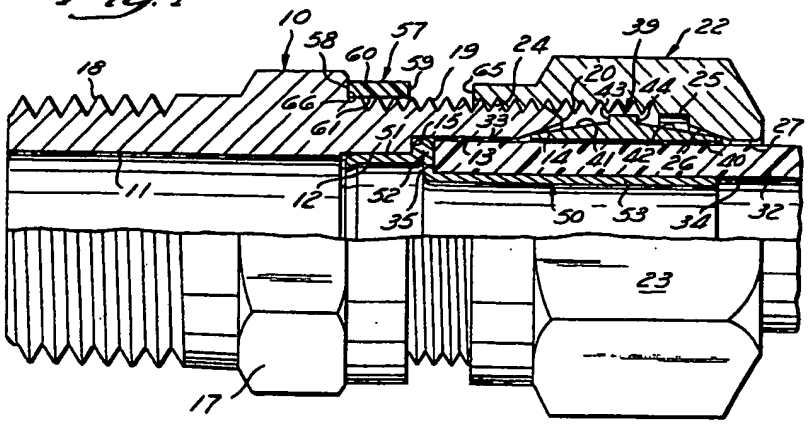
Fig. 1



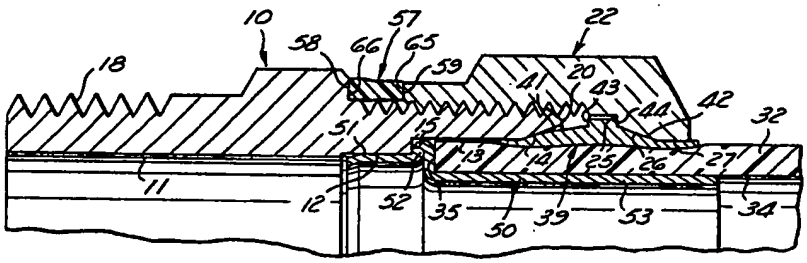


Fig. 2

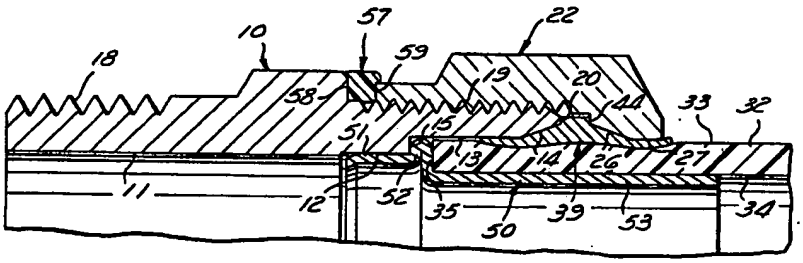


Fig. 3